

## 1.2 Points Lines and Planes

Object	Example	Name	Symbol
A <u>point</u> is a location in space.			
A <u>line</u> is made up of infinitely many points it extends in both directions forever.			
A <u>line segment</u> is part of a line. It has two endpoints.			
A <u>ray</u> is part of a line. It has one endpoint.			
A <u>plane</u> is a flat surface. It extends endlessly in all directions.			

Write the definitions of the following terms:

Collinear

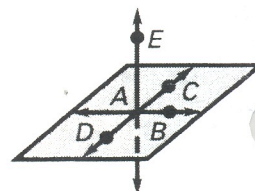
Coplanar

Opposite Rays

Intersection

### Example 1 Naming Collinear and Coplanar Points

- Name three points that are collinear.
- Name three points that are coplanar.
- Name four points that are not coplanar.

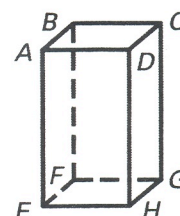


#### Solution

- Points     ,     , and      lie on the same line, so they are collinear.
- There are many correct answers. For instance, points     ,     , and      lie on the same plane. Also, points     ,     , and      are coplanar, although the plane containing them is not drawn.
- There are many correct answers. For instance, points     ,     ,     , and      do not lie on the same plane.

### ✓ Checkpoint Complete the following exercises.

- Name three points in the diagram that are not collinear.



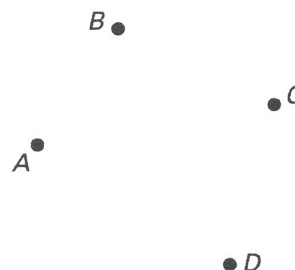
- Name the point in the diagram that is coplanar with points A, D, and E.

### Example 2 Drawing Lines, Segments, and Rays

Draw four noncollinear points, A, B, C, and D. Then draw  $\overline{AB}$ ,  $\overrightarrow{BC}$ ,  $\overleftrightarrow{CD}$ ,  $\overleftrightarrow{DA}$ , and  $\overrightarrow{BD}$ .

A, B, C, and D are shown.

- Draw  $\overline{AB}$ .
- Draw  $\overrightarrow{BC}$ .
- Draw  $\overleftrightarrow{CD}$ .
- Draw  $\overleftrightarrow{DA}$ .
- Draw  $\overrightarrow{BD}$ .



**Example 3** *Drawing Opposite Rays*

**Draw a line. Label three points on the line and name a pair of opposite rays.**

Draw points X, Y, and Z on the given line so that Y is between X and Z.

The opposite rays are \_\_\_\_\_ and \_\_\_\_\_.



**Example 4** *Sketching Intersections*

**Sketch two lines that do not intersect and a line that intersects each of the other lines.**

Draw a line that does not intersect the given line.

Then draw a third line that intersects the first two lines. Emphasize the points of intersection.



**Practice A**

For use with pages 10–16

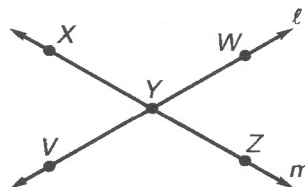
SHOW WORK & ANSWERS ON  
NOTEBOOK PAPER**Draw a sketch and label as needed.**

- Three collinear points,  $A$ ,  $B$ , and  $C$ .
- Coplanar points  $W$ ,  $X$ ,  $Y$ , and  $Z$ .

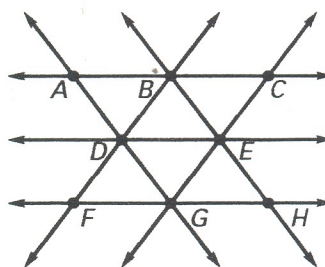
- $\overleftrightarrow{MN}$  intersecting  $\overleftrightarrow{PQ}$  at point  $R$ .
- Opposite rays,  $\overrightarrow{JK}$  and  $\overrightarrow{JC}$ .

**Decide whether the statement is true or false.**

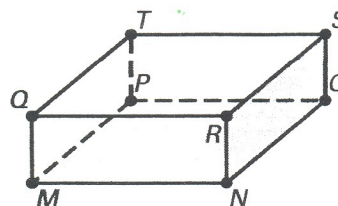
- Point  $X$  lies on line  $m$ .
- Point  $W$  lies on line  $m$ .
- Point  $V$  lies on line  $l$ .
- Point  $Y$  lies on line  $l$ .
- $X$ ,  $Y$ , and  $Z$  are collinear.
- $X$ ,  $Y$ , and  $Z$  are coplanar.
- $V$ ,  $Y$ , and  $X$  are collinear.
- $V$ ,  $Y$ , and  $X$  are coplanar.

**Name a point that is collinear with the given points.**

- $B$  and  $E$
- $D$  and  $G$
- $H$  and  $E$
- $A$  and  $D$
- $F$  and  $H$
- $A$  and  $C$
- $G$  and  $C$
- $B$  and  $C$

**Name a point that is coplanar with the given points.**

- $M$ ,  $N$ , and  $O$
- $T$ ,  $Q$ , and  $M$
- $T$ ,  $S$ , and  $R$
- $O$ ,  $S$ , and  $R$
- $M$ ,  $N$ , and  $R$
- $T$ ,  $Q$ , and  $R$
- $T$ ,  $S$ , and  $O$
- $O$ ,  $P$ , and  $M$

**In Exercises 29–34, complete the sentence.**

- Collinear points are points that \_\_\_\_.
- Coplanar points are points that \_\_\_\_.
- $\overline{XY}$  consists of the endpoints  $X$  and  $Y$  and all points on the line  $\overleftrightarrow{XY}$  that lie \_\_\_\_.
- $\overrightarrow{MN}$  consists of the initial point  $M$  and all points on the line  $\overleftrightarrow{MN}$  that lie \_\_\_\_.
- Two rays or segments are collinear if they \_\_\_\_.
- $\overrightarrow{PQ}$  and  $\overrightarrow{PT}$  are opposite rays if \_\_\_\_.
- Explain the difference between  $\overrightarrow{BC}$  and  $\overrightarrow{CB}$ .



# Plotting Points

## GOAL

Graph and identify points in the coordinate plane.

Ordered pairs of real numbers are used to represent real-life relationships. Graphing the ordered pairs on a coordinate plane gives a visual picture of this relationship.

### Terms to Know

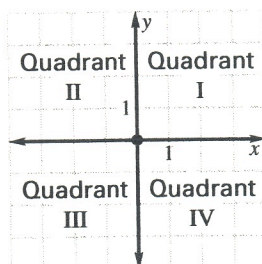
### Example/Illustration

<b>Coordinate Plane</b> plane formed by two real number lines intersecting at a right angle	
<b>Origin</b> point in a coordinate plane at which the horizontal axis intersects the vertical axis. The point (0, 0).	
<b>x-axis</b> horizontal axis in a coordinate plane	
<b>y-axis</b> vertical axis in a coordinate plane	
<b>Ordered Pair</b> pair of real numbers used to locate each point in the coordinate plane. The first number in an ordered pair is called the <b>x-coordinate</b> and the second number is called the <b>y-coordinate</b>	

### Understanding the Main Ideas

The coordinate plane extends one dimensional graphing into two dimensions. When you are plotting points in a coordinate plane, all plotting starts at the origin (0, 0).

The axes divide the coordinate plane into four parts called **quadrants**. All points (x, y) lie in a quadrant except for points with a 0 (zero) coordinate, which fall on either the x- or y-axis. The quadrants are labeled as shown below.



(continued)

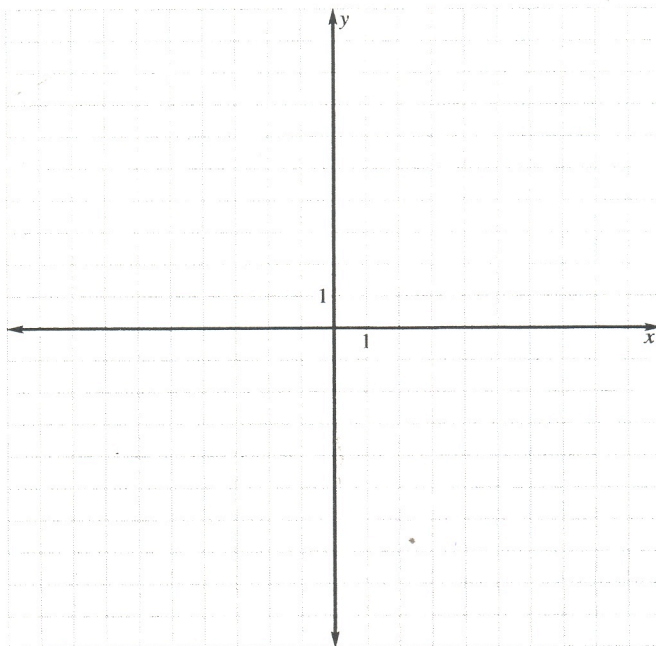
**Practice**

For use with Lesson 5.1: Plotting Points

SHOW WORK HERE!

Plot and label each of the following points on the coordinate plane.

1.  $A(6, -7)$
2.  $B(-4, 3)$
3.  $C(-5, -1)$
4.  $D(0, -1)$
5.  $E(2, 9)$
6.  $F(-5, 0)$
7.  $G(0, 0)$
8.  $H(-8, -10)$
9.  $I(9, 6)$
10.  $J(2, -2)$



Give the coordinates of each point on the graph and the quadrant in which it lies.

11.  $A$
12.  $B$
13.  $C$
14.  $D$
15.  $E$
16.  $F$
17.  $G$
18.  $H$
19.  $I$

